Per- and Polyfluoroalkyl Substances (PFAS)

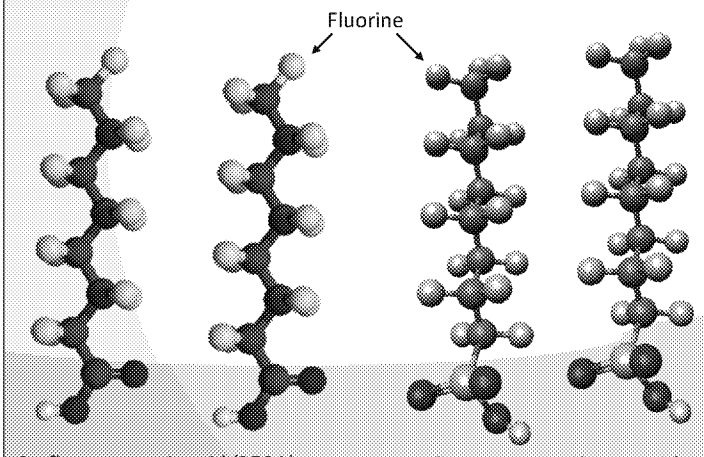
January 18, 2018

U.S. Environmental Protection Agency

Outline

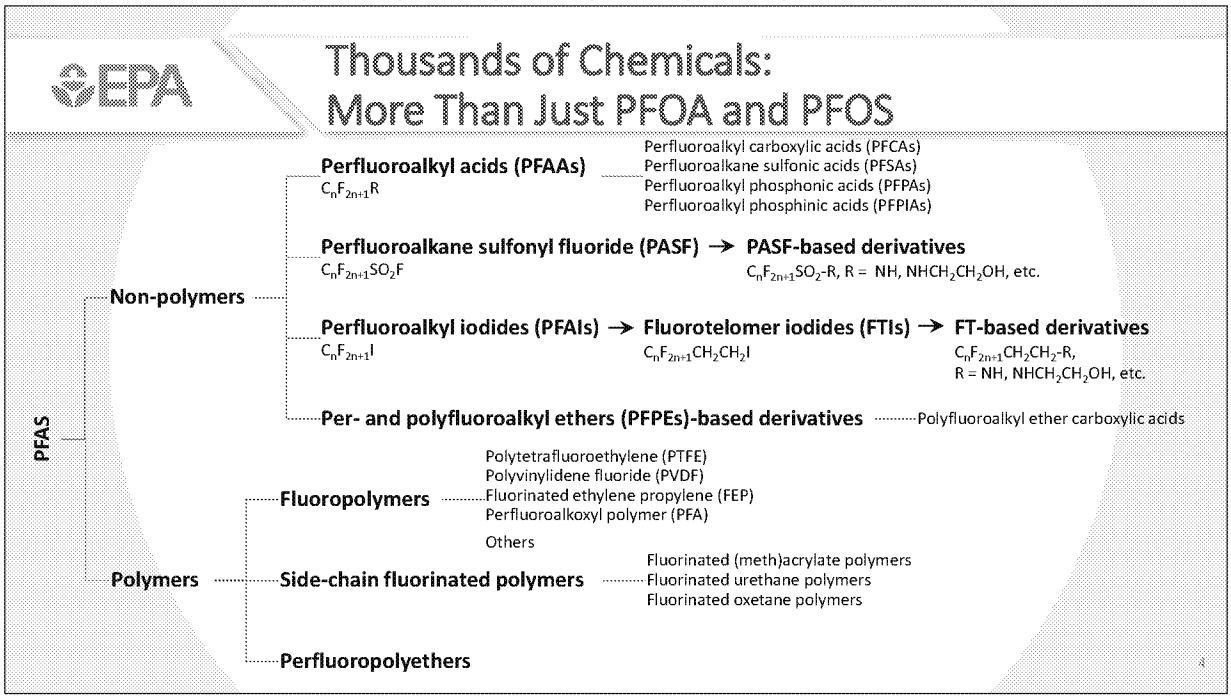
- What are Per- and Polyfluoroalkyl Substances (PFAS)?
- How are PFAS used?
- What is EPA doing about it?

Per- and Polyfluoroalkyl Substances (PFAS)



Perfluorooctanoic acid (PFOA) *Perfluorooctanesulfonic acid (PFOS)*

- **A class of man-made chemicals**
  - Chains of carbon (C) atoms surrounded by fluorine (F) atoms
    - Water-repellent
    - Stable C-F bond
  - Some PFAS include oxygen, hydrogen, sulfur and/or nitrogen atoms, creating a polar end



PFOA = perfluorooctanoic acid – PFCA

PFOS = perfluorooctanesulfonate – conjugate base of PFSA

“Per” = fully fluorinated

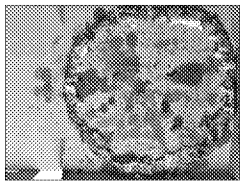
“Poly” = many fluorines

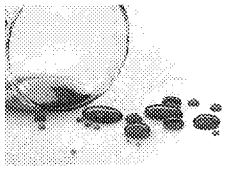
Sources of PFAS: Production, Application

- Fluorochemical production facilities
- Mist suppression for chrome plating
- Electronics manufacturing
- Oil and mining for enhanced recovery
- Performance chemicals such as hydraulic fluid, fuel additives, etc.

Used in Homes, Businesses & Industry

- Food contact surfaces such as cookware, pizza boxes, fast food wrappers, popcorn bags, etc.
- Polishes, waxes, and paints
- Stain repellants for carpets, clothing, upholstered furniture, etc.
- Cleaning products





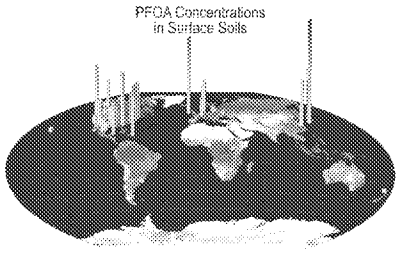
PFAS in the Environment

- Direct release of PFAS or PFAS products into the environment
  - Use of aqueous film forming foam (AFFF) in training and emergency response
  - Release from industrial facility
- Landfills and leachates from disposal of consumer and industrial products containing PFAS
- Land where wastewater treatment plant biosolids was applied

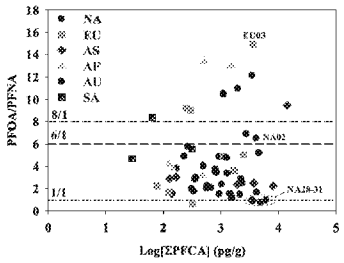
Because of volatiles, PFASs are distributed worldwide

Collected remote soils (forest, tundra) from around the world

Found PFASs in every soil sample, including Antarctica



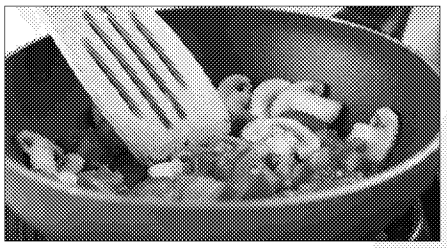
Homologue ratios confirmed that "mode of occurrence" was from oxidation of volatile precursors



PFOA/PFNA (C8/C9) ratios of 1 to 8 suggest oxidation of volatiles

Reasons for Concern

- Known or suspected toxicity, notably for PFOA and PFOS
- Resist decomposition in the environment and in human bodies
- Used by a variety of industries
- Found in a variety of consumer products
- Most people have been exposed to PFAS



Collaboration with Ohio State University: Washington Works

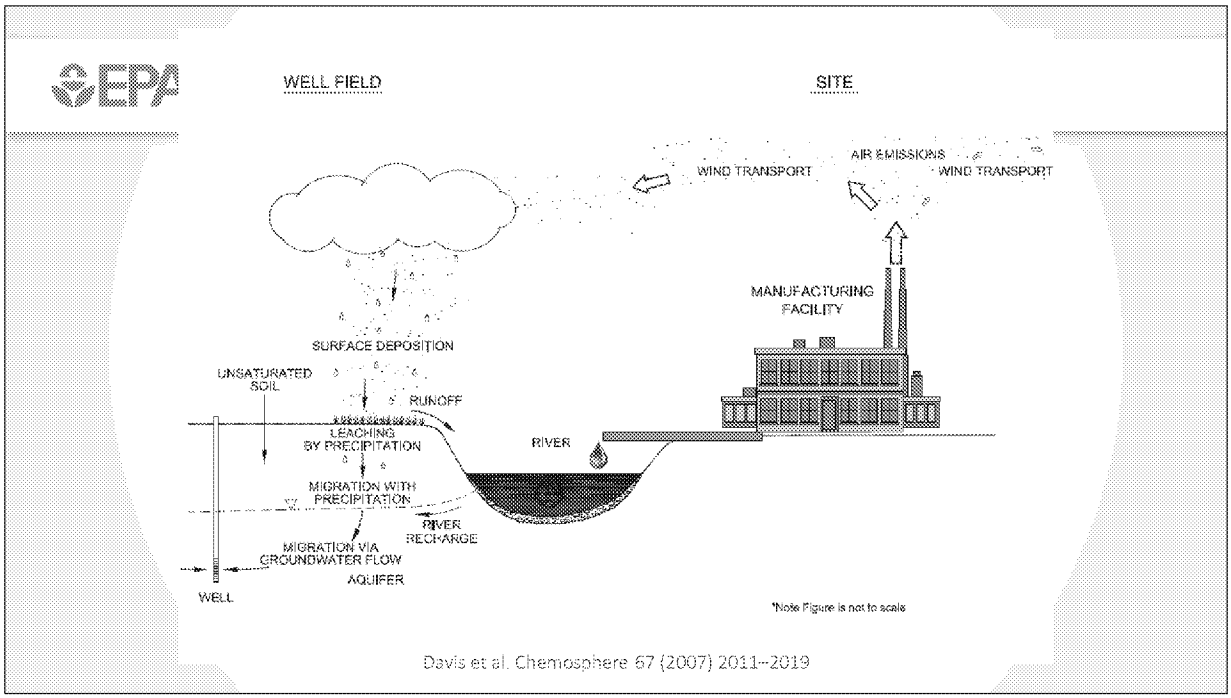
OSU student Jason Galloway contacted NERL researchers after reading *Intercept* article on Strynar et al. (2015) publication on GenX contamination in Cape Fear River, May 2016

Directed work to Dr. Linda Weavers, Civil and Environmental Engineering Department

Three rounds of field sampling and analysis summer and fall of 2016, OSU collection and analysis, EPA equipment and mentoring

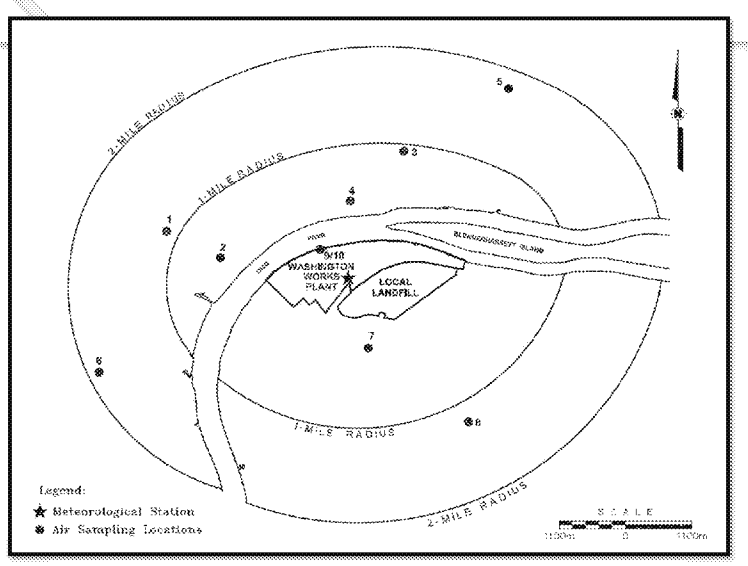
Evolving scope and focus: initial concern of undocumented legacy PFOA contamination expanded after discovery of GenX

Presentation of preliminary findings at Northeastern University conference in June 2017, draft manuscript in preparation



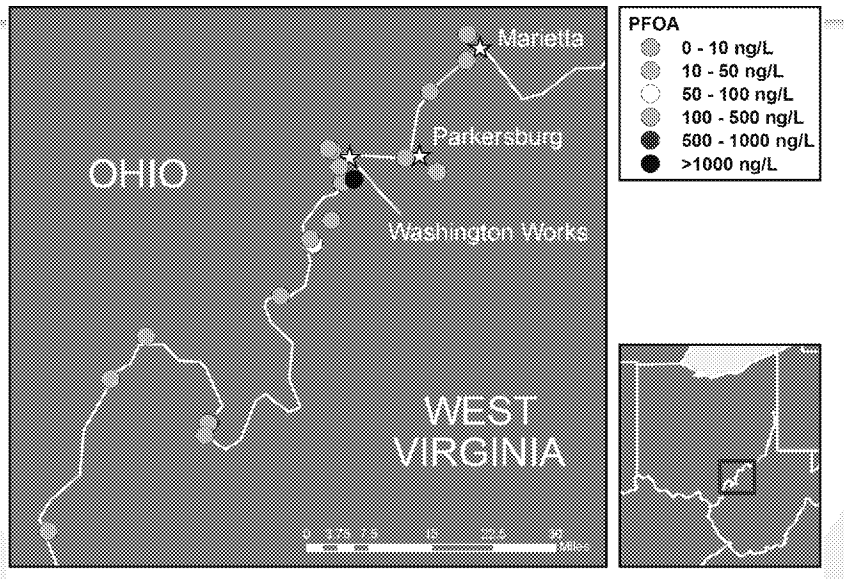
Davis et al. Chemosphere 67 (2007) 2011–2019

Previous Monitoring Around Washington Works

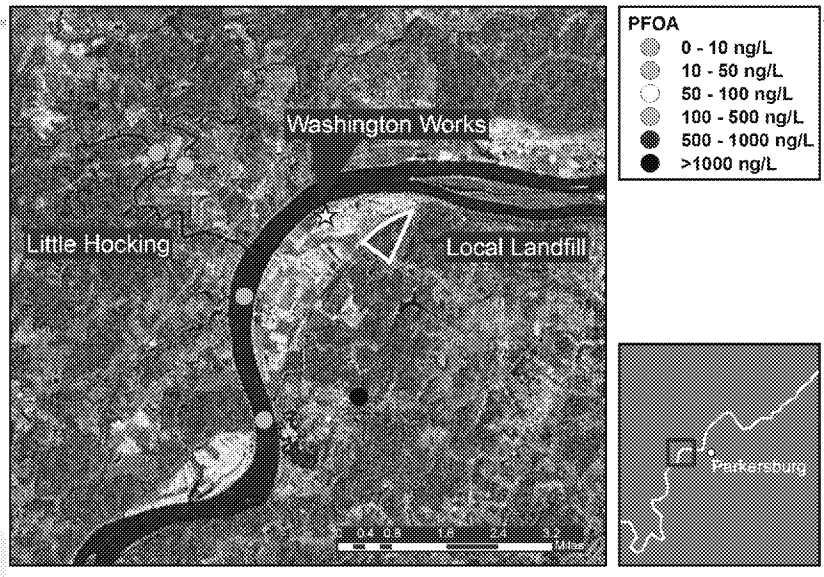


Barton et al. *Journal of the Air & Waste Management Association* 2010, 60, 402–411

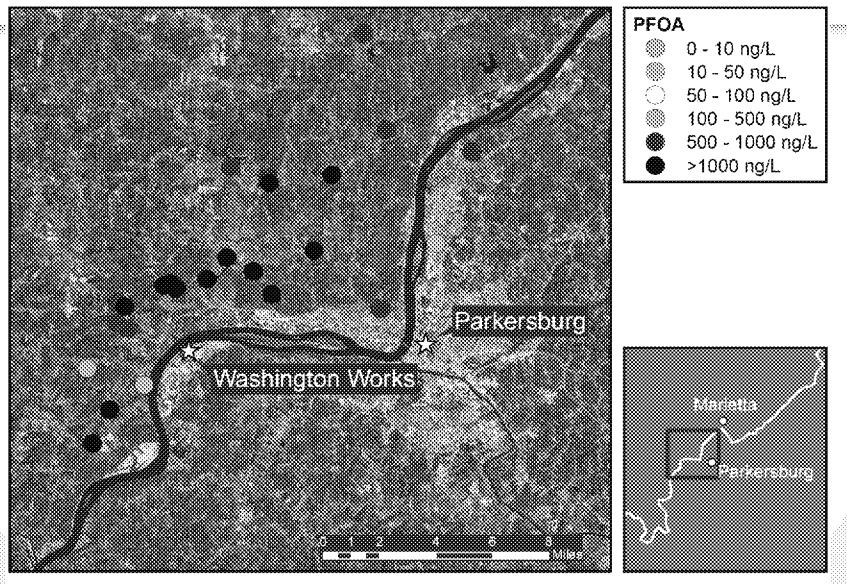
Ohio River Results



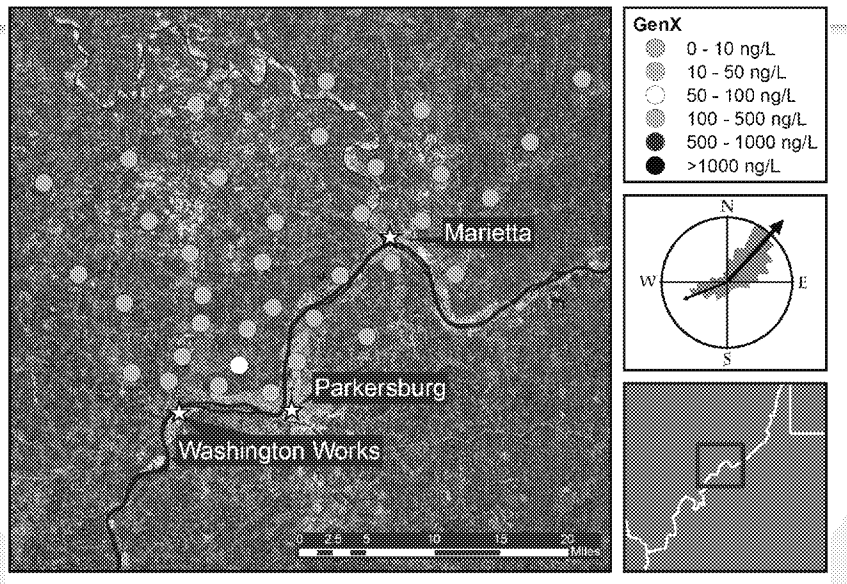
Ohio River Results (Detail)



Little Hocking Results



Extended Sampling Results



Conclusions with Ohio State University

The presence of significant levels of PFOA (>100 ng/L) in surface water more than 15 miles from the facility and quantifiable levels (>10 ng/L) more than 25 miles away suggests contamination may be more extensive than originally thought

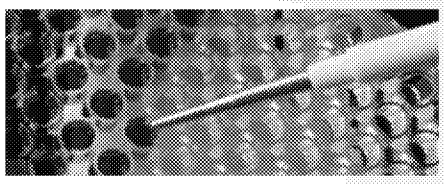
The discovery of GenX at many of the collection sites suggests the replacement PFAS is contaminating the local environment via air deposition as well

More testing is needed – especially private well water between the boundaries of the Little Hocking Public Water district and the Muskingum River

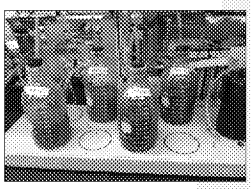
Communications: ORD has briefed R5 (Kim Harris), R3 (Rick Rogers), Ohio EPA, manuscript in preparation

Current EPA PFAS Research Activities

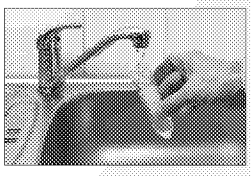
- **Human Toxicity**
  - Understand human health toxicity
  - Inform risk mitigation activities
  - Chemical library and high throughput toxicity testing



- **Laboratory Methods**
  - Establish validated laboratory methods for measuring PFAS in different environmental media



- **Human Exposure**
  - Identify and estimate human exposure to PFAS from different sources
- **Drinking Water Treatment and Site Remediation**
  - Reduce PFAS exposures
  - Treat and remediate drinking water and contaminated sites



EPA's PFAS Coordinating Committee

- **EPA announced cross-Agency effort to address PFAS in December 2017**
  - Cross-Agency team includes Program and Regional reps
- **As part of that effort, EPA will:**
  - Identify a set of near-term actions that EPA will take to help support local communities
  - Enhance coordination with states, tribes and federal partners to provide communities with critical information and tools to address PFAS
  - Increase ongoing research efforts to identify new methods for measuring PFAS and filling data gaps
  - Expand proactive communications efforts with states, tribes, partners and the American public about PFAS and their health effects
- **Response due to Deputy Administrator on Friday January 19**

Current EPA PFAS Activities: Water

- **Published Drinking Water Health Advisories (HA) in 2016 for PFOA and PFOS**
  - HAs are non-regulatory information for federal, state and local officials to consider when addressing drinking water contamination
  - Identified 0.07 µg/L (70 parts per trillion) as the HA level for PFOA and PFOS combined and provided information about treatment and monitoring
- **Evaluating PFOA and PFOS for regulatory determination under the Safe Drinking Water Act (SDWA)**
  - PFOA and PFOS are on the fourth Contaminant Candidate List (CCL 4) published in November 2016. OW is assessing PFOA and PFOS against the three SDWA regulatory determination criteria
    - *May have an adverse effect on the health of persons*
    - *Is known to occur or there is a substantial likelihood that it will occur in public water systems with a frequency and at levels of public health concern*
    - *In the sole judgment of the Administrator, regulating the contaminant presents a meaningful opportunity for health risk reductions for persons served by public water systems*
  - From 2013 to 2015, EPA collected nationally representative data on the occurrence of six PFAS in public water systems (including PFOA and PFOS)
  - EPA must decide whether or not to regulate at least five CCL4 contaminants by January 2021

Current EPA PFAS Activities: Waste Sites

- **EPA Federal Facility Superfund Program**
  - Actively engaged in a PFAS investigation and remediation process at 32 Federal Facility NPL Sites
  - It is anticipated that this number will grow since there are known or suspected contaminations of PFAS at many of the 140 DOD Federal Facility NPL Sites
  - PFAS detections in groundwater range from non-detect (based on analytical method limitations) or slightly exceeding the Drinking Water Health Advisory of 70 parts per trillion (ppt; PFOA and PFOS combined) to 2,000,000 ppt
  - Drinking water has been potentially impacted at 17 of these Federal Facility NPL sites
- **Office of Superfund Remediation and Technology Innovation (OSRTI)**
  - 17 known impacted non-Federal NPL sites
  - 100s of potential NPL sites (e.g., 100 metal plating sites, 300 landfills)
- **Regional Assistance**
  - Holding site-specific consultations with EPA Regions on investigations of PFAS contamination
  - OSRTI/FFRRO provides ongoing technical assistance on PFAS issues and also coordinates with the Regions on their needs and priorities on PFAS issues

Current EPA PFAS Activities: Chemical Use

- **PFOA Stewardship Program**
  - Eight companies participated in the program and successfully eliminated production of PFOA
  - Resulted in phase-out of PFOA and related PFAS, including potential PFOA precursors, by these companies by the end of 2015
- **EPA's New Chemicals Program**
  - Since 2000 have reviewed hundreds of pre-market alternatives for PFOA and related chemicals
  - Most were approved with restrictions and data-generation requirements
- **Significant New Use Rule (SNUR)**
  - Proposed on January 21, 2015, to require manufacturers, importers, and processors of PFOA and related chemicals (including as part of articles), to notify EPA at least 90 days before starting or resuming new uses of these chemicals in any products
  - Notification provides EPA opportunity to conduct risk assessment/management for the new use
- **Gen X**
  - Determining the need to revise the GenX risk assessment originally done for its pre-market approval, based on data received by the company and other information arising from the NC situation

Summary: EPA Actions on PFAS

- **Complex – multi chemical, multi media, multi route problem**
- **Implications for all EPA Programs and Regions**
- **Still many unknowns: exposure, toxicity, risk and remediation**
- **EPA Action Agenda forthcoming**
  - Short term actions (6 months)
  - Longer term actions (> 6 months)
- **ORD will be developing a more detailed R&D plan, oriented around supporting Regions, States and Tribes in decision-making**